REMARKS

The Office Action dated May 7, 2003, was carefully reviewed. Claims 1, 2, 4, 5, 8, 12 and 15 are amended. Claim 14 is cancelled. Claims 1-13 and 15-18 remain in the application. It is respectfully requested the Examiner reconsider the present application in light of the amendments and remarks herein.

The Examiner rejected claims 1-18 under 35 U.S.C. § 112, second paragraph. The Examiner is still unclear as to the sense axis. The y-axis is the output axis, also called the sense axis. See page 5 of the specification where the y-axis is described at lines 9 through 14. See also page 8, lines 25 through 27, where the y-axis is described as the sense axis. However, to avoid confusion, the claims have been amended to use the term y axis throughout the claims.

The Examiner indicated that "misalignment" in line 7 appears to be different from "misalignment" in line 5. The claims have been amended to clarify this is the same misalignment.

The Examiner indicated "an electrode" implies an electrode different than that of the "four electrodes." An electrode is an electrode of the at least four electrodes, and the claims have been amended to correct the ambiguity.

The Examiner indicated that "cross axis" is unclear and that production of "a force in cross axis" is not found in the disclosure. The claims have been amended to use language consistent with the specification.

The present invention teaches applying an electrostatic bias adjustment to an electrode in the electrode plane to counteract a mechanical cross-coupling spring force. A cross-coupled electrostatic bias adjustment is applied to one of the electrodes in the electrode plane to compensate for the mechanical cross-axis stiffness association with the original mechanical misalignment that is a result of the fabrication, or manufacture, of the microgyroscope. This will also be discussed in greater detail hereinafter with respect to the rejection under 35 U.S.C. § 112, first paragraph.

The Examiner's rejection of claim 14 is moot now that claim 14 has been cancelled from consideration.

The Examiner rejected claims 1-18 under 35 U.S.C. § 112, first paragraph. Specifically the Examiner is unclear what is designated by "cross axis stiffness" and "cross-coupled electrostatic stiffness." The Examiner is also unclear on the concept of "a force perpendicular to the electrode plane" and how counteracting the Coriolis force indicates "a force perpendicular to the electrode plane."

All reference to "cross-axis" has been removed from the claims as presently amended. The claim language is now strictly consistent with the description in the specification. See claims 1 and 5 as being representative of the independent claims in the present invention. Support for the claim amendments will be discussed first, and then a clarification of the "cross-coupled electrostatic stiffness" will follow.

In claim 1, support for "a resonator plate elastically suspended in an x-y plane defining a resonator plate suspension" is found at page 4, lines 24 to 27. References to the rocking motion of the resonator plate are found throughout the specification and specifically at page 5, lines 6-13 and beginning at line 6 on page 10. Support for "mechanical misalignment", "K_{xy}", and cross-coupling electrostatic stiffness, "K^e_{xy}" can be found at page 10 in the equation governing inertia and stiffness misalignment. Also at page 12, lines 9-24 and again at page 13, lines 7-11.

In claim 5, support for "residual mistuning that is a result of mechanical asymmetry" is supported at page 9, lines 10-15. Support for "producing a negative electrostatic stiffness..." can be found at page 9, lines 20-23 and page 13, lines 24-26.

Support for the amendments to claim 8 follow the support identified for claims 1 and 5.

In the fabrication of a microgyroscope, it is inevitable that asymmetry, also called mistuning, and imbalance, also called mechanical misalignment or rocking imbalance stiffness, of the resonator plate will occur. In the present invention, stiffness is introduced to counteract the inherent mistuning and misalignment, rocking imbalance stiffness, by applying an electrostatic bias voltage to an electrode in the electrode plane. See page 12, lines 9-20. A cross coupling electrostatic spring, K^e_{xy}, applied to an electrode in the x-y plane generates an electrostatic torque, T_y, in response to a displacement about the x-axis, thereby

nulling the motion of the post on the y-axis. Tuning is accomplished by increasing or decreasing the bias voltage on one of the electrodes as well. See page 12, lines 21-24 and page 13, lines 7-11 and lines 20-23.

In other words, an electrostatic bias adjustment to an electrode creates a stiffness force that counteracts any asymmetric mechanical spring force. This is what was meant by "production of a force perpendicular to the electrode plane."

Because the Examiner is asserting the term cross axis is not clear, the claims have been amended in an attempt to clarify the effect of the forces applied to correct mechanical misalignment and mistuning according to the present invention. According to the present invention, the electrostatic bias adjustments are applied to electrodes in the electrode plane. The electrode plane is separate from the resonator plane. The present invention corrects misalignment and tuning by means of forces that are out-of-plane with the motion of the microgyroscope.

It is respectfully asserted that the amended claims, in light of the remarks herein, are not indefinite and the specification is enabling to one skilled in the art to which it pertains. It is respectfully requested the Examiner withdraw the rejection of claims 1-18 under 35 U.S.C. § 112, first and second paragraphs.

The Examiner rejected claims 1-18 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent No. 6,164,134 to Cargille. It is respectfully asserted that the present invention is patentable over the Cargille reference.

The present invention teaches and claims applying an electrostatic bias adjustment to an electrode in the electrode plane, producing a counteracting force. The counteracting force acts to restrain displacement about the sense axis caused by mechanical asymmetry and imbalance.

The Cargille reference teaches a microgyroscope and control circuit for a microgyroscope that prevents unwanted cross coupling capacitance. Cargille accomplishes this objective by teaching an electrode pattern and control circuit that provides a balanced push-pull circuit. The drive and sense electrodes are symmetrical and opposing to minimize capacitive coupling among electrodes.

The operation of a microgyroscope induces a Coriolis force that causes unwanted movement of the baton in the microgyroscope. The Cargille reference teaches first and second rate driving electrodes having equal and opposite polarity to force movement of the output axis to zero. This re-balance signal is applied to the first and second rate driving electrodes to offset possible movement and hold the baton in place. Further the rebalance signal is applied equally an in opposite polarity to the first and second rate driving electrodes.

This is significantly different from the present invention, which teaches applying an electrostatic bias adjustment to an electrode in the electrode plane to adjust for mechanical asymmetry and imbalance in the microgyroscope that is inherent in its fabrication and a result of the rocking motion of the suspended resonator plate. The electrostatic bias adjustment, applied to an electrode in the electrode plane, but not on the x or y axis, introduces an electrostatic cross-

coupled stiffness, K^{e}_{xy}. Applying an electrostatic bias voltage to one of the electrodes, i.e., one of the drive electrodes D1 or D2 in Figure 1 or one of the electrodes Q1 or Q2 in Figure 4 introduces the cross-coupled electrostatic stiffness having a corrective effect on the microgyroscope's mechanical stiffness imbalance (see specification at page 12, line 9 through page 13 line 9.

Should the Examiner have any questions or comments that may place the application in better condition for allowance, he is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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